

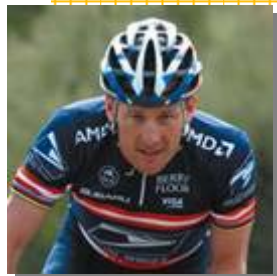
# AMD Leadership overview

Joint AMD-HP-VMware event.

Warsaw, October 11th, 2005

- Company Overview
- AMD leadership
- AMD Opteron technology
- Power Advantage
- Software readiness
- Performance and Virtualisation benefits

**A leading global supplier of innovative semiconductor solutions for the personal and enterprise computing, communications and consumer electronic markets**



**Founded: 1969**

**Headquarters: Sunnyvale, California**

**Employees: 15,000 worldwide**

**Sales Mix: 80% international**

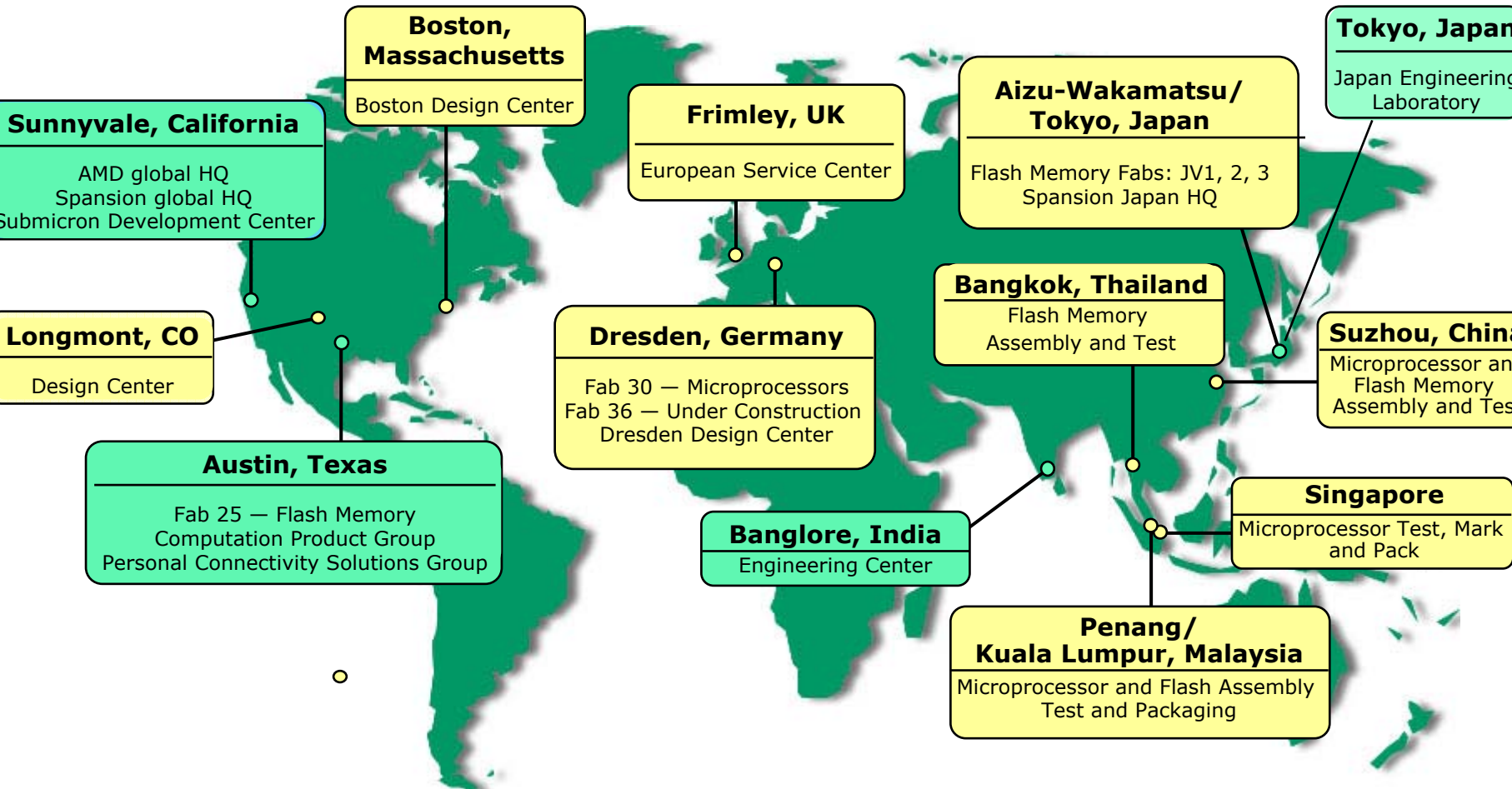
**2004 Revenue: \$5 billion**

**2004 Q4 Revenue: \$1.3 billion**

**2004 sales up 42 percent to all-time high of \$5.0 billion; microprocessor sales grew 29 percent –**

**– Fourth quarter processor sales increased nine percent sequentially, driving fifth consecutive quarter of positive operating income –**

# AMD Worldwide Operations





# AMD Fab 30 Delivering on the Promise



## Fab 30 Production



- **AMD64 products running at mature yields**
- **90nm AMD64 products**
- **Technology Leadership:**
  - **Transistor performance**
  - **First to volume copper**
  - **First to volume SOI**
  - **First to volume low-k**



# AMD Fab 36

*AMD is Building on Dresden*



AMD Fab 36

New Utility Building

Fab 30  
(Fab of the Year 2001)

Model based on planned construction.

## Industry has and continues to embrace AMD64:

- Adopted by more than **2,000** computer manufacturers worldwide.
- Sold by **three out of the top four** computer manufacturers worldwide.
- Today, **more than 75 percent of Forbes Global 100 companies** or their affiliates use AMD64 processor-based systems to run critical enterprise applications.
- Selected for **31** of the world's 500 highest-performing supercomputers as ranked by TOP500.org in November 2004.
- Supported by more than **300** software developers worldwide representing **1,300** software packages.
- Received more than **80** technology leadership & industry awards



75% of Fortune 100 companies use today AMD  
Opteron based servers



## Major Opteron Markets

- Finance/Banking
- Insurance
- Manufacturing/Transportation
- Telco/WEB/GSM
- Oil/GAS
- ISV's
- Science/Education/Universities,
- Government

*Customer list includes ABN Amro, AOL, Boeing,  
DaimlerChrysler, Goldman Sachs, Microsoft Treasury  
and many others*



# "Suddenly, It's AMD Inside"



"BusinessWeek best managers of 2004....Ruiz has become Mr. Fix-It"

"Were giving customers real choice"

"Getting superefficient, low heat chips out will keep AMD ahead of the competition"

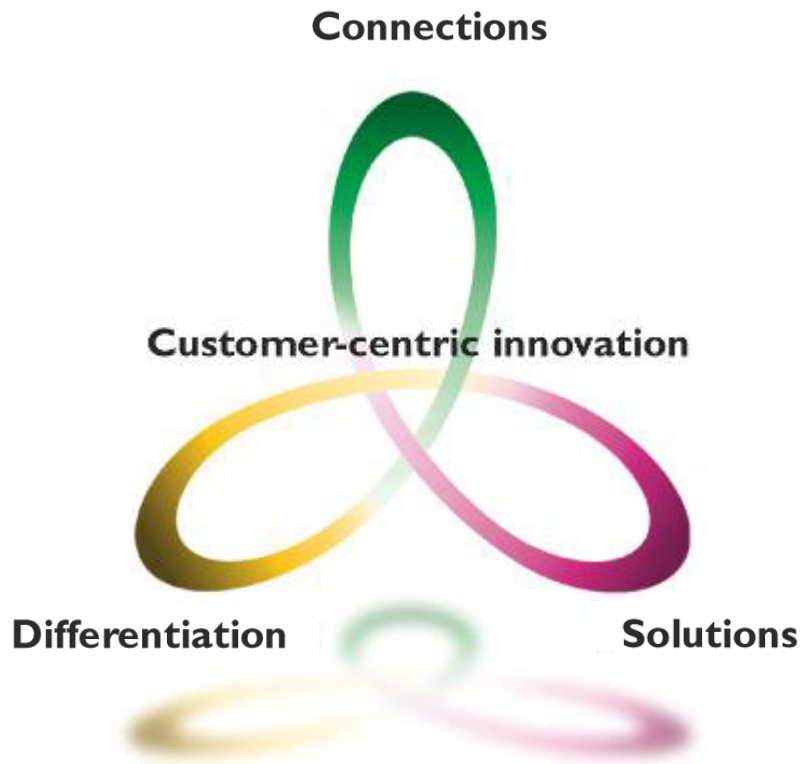
"The Company's striking success raises the possibility of a profound shift in the technology industry."

"...first to market by more than a year with a new class of microprocessors that's popular with corporate clients."

"It has smoothly launched new manufacturing techniques..."

"...and left Intel scrambling to catch up."

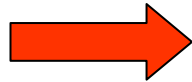
## Customers are at the center of everything we do



**Expand connections with customers, partners and end users**

**Evolve beyond products and technologies to solutions**

**Enable meaningful customer differentiation at ever-declining costs**



**Product life cycles**

**Time to market**

**Power Consumption / Heat**

**Large datasets**

**Performance requirements**

**Cost reduction**

## AMD64 Leadership Milestones:

- **First** to present an x86 multi-core strategy in 1999.
- **First** to ship products that meet customer demands for high-performance, simultaneous x86-based 32- and 64-bit computing.
- **First** to help eliminate the bottlenecks inherent in x86 front-side bus architectures.
- **First** to implement 64-bit computing and Enhanced Virus Protection (enabled with Windows® XP Service Pack 2 and Windows Server 2003 SP1\*)
- **First** to launch and ship x86 64-bit dual-core parts for servers and workstations (April 21, 2005).



\* Enhanced Virus Protection, enabled by Windows XP Service Pack 2 and Windows Server 2003 SP1, will by default only protect the user's Windows operating system. After properly installing the appropriate Windows release, users must enable the protection of their applications and associated files from memory buffer overrun attacks. Contact your application software vendor for information regarding use of the application in conjunction with Enhanced Virus Protection. AMD and Microsoft strongly recommend that users continue to use third party anti-virus software as part of their security strategy.



# Strategic Alliance with HP

## Time to market factor



- HP today has the broadest stack of AMD64 based systems, including:

- Proliant Opteron-based servers

- DL145G2
- DL385
- DL585
- Blade Servers BL25, BL35, BL45

- 2-way Workstation

- Xw9300

- Clients

- DX5150 MicroTower and SFF
- Nx6125 SMB Notebook

- More to come soon



- Company Overview
- AMD leadership
- **AMD Opteron technology**
- Power Advantage
- Software readiness
- Performance and Virtualisation benefits

**Can you meet today's  
challenges with 25 years old  
technology  
?**

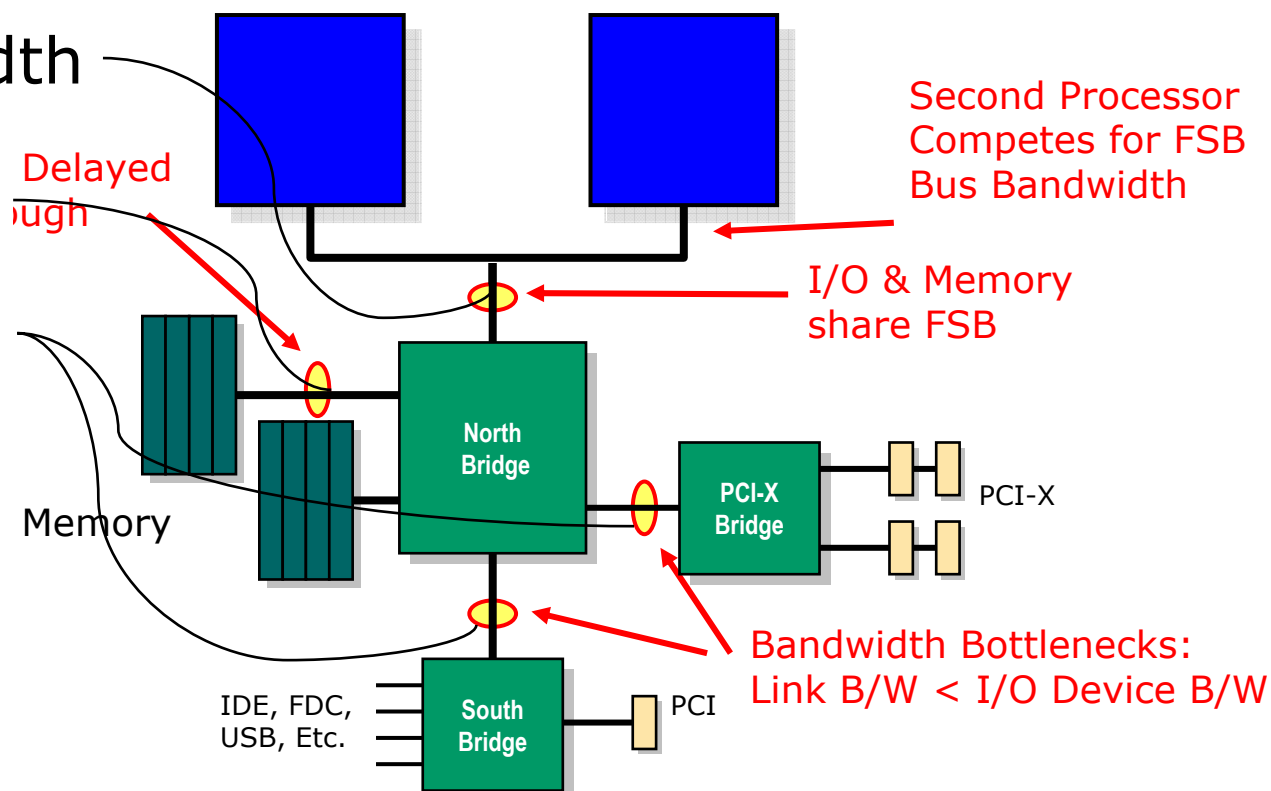
# Known Bottlenecks of Front-Side-Bus (FSB) based Computers



Memory Bandwidth

Memory Latency

I/O Performance





# AMD Opteron™ Processor Single Core overview



- **Outstanding Performance**

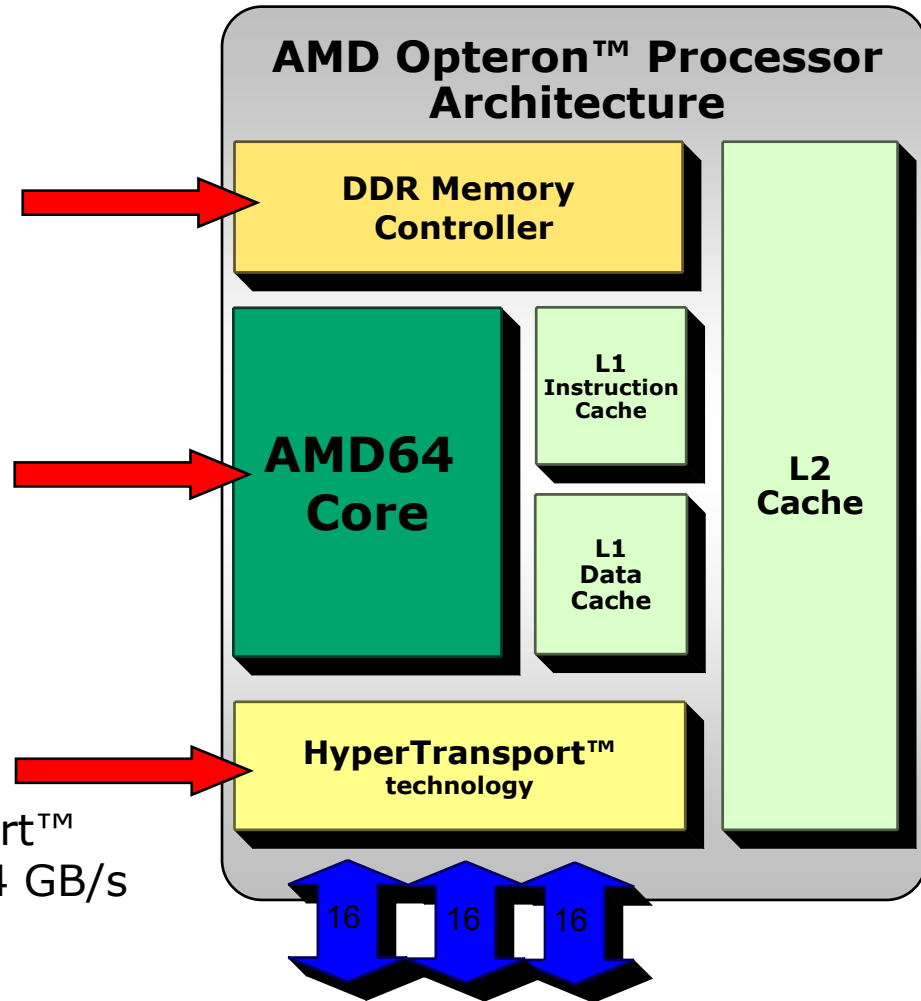
- High-bandwidth integrated memory controller scales with processor frequency and number of processors

- **64-bit Architecture with 32-bit Compatibility**

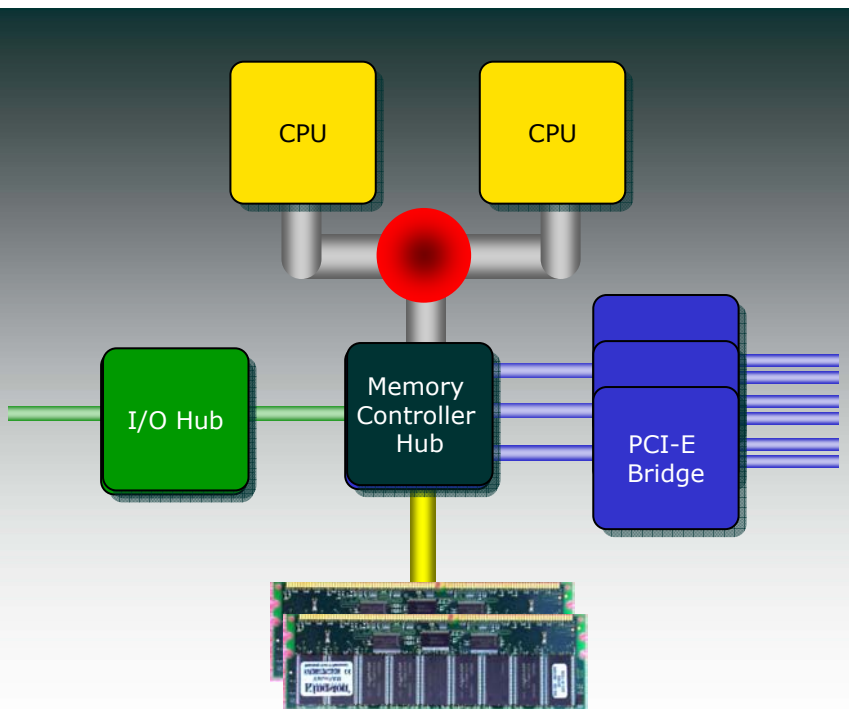
- Approximately 10,000 legacy applications at time of launch

- **Exceptional Scalability**

- Direct Connect scaling
- Removes I/O bottlenecks
  - Three 16-bit HyperTransport™ technology links provides 24 GB/s peak aggregate bandwidth

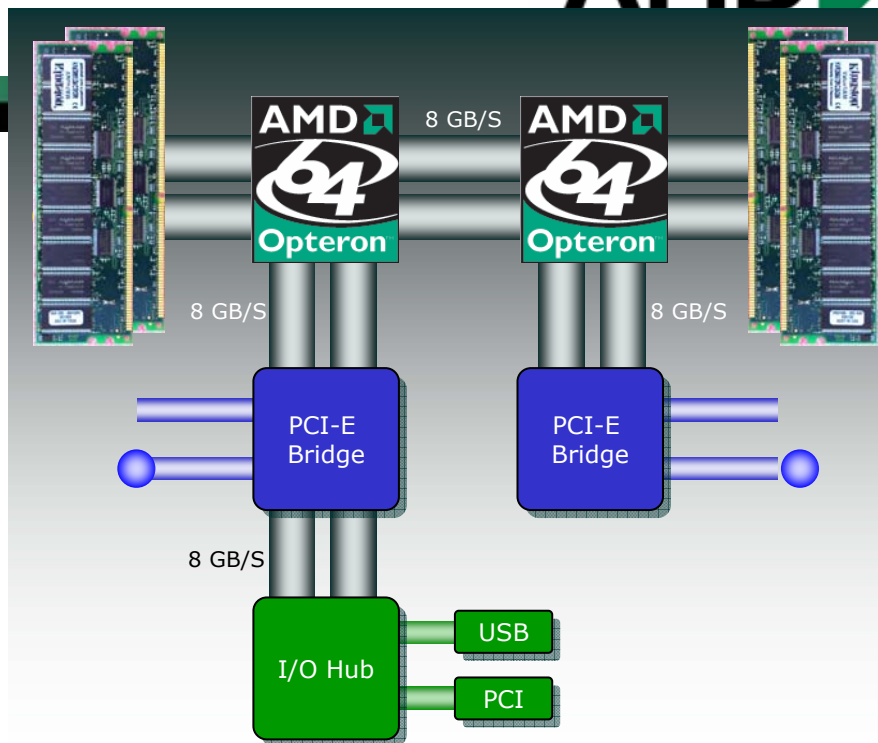


# Eliminating Architectural Bottlenecks



## Legacy x86 Architecture

- 20-year old front-side bus architecture
- CPUs, Memory, I/O all share a bus
- Major bottleneck to performance
- Faster CPUs or more cores  $\neq$  performance



## AMD64 with DirectConnect

- Industry Standard AMD64 technology
- Direct Connect Architecture eliminates FSB bottleneck
- HyperTransport™ interconnect for max bandwidth and min latency

# AMD64 Dual-Core Architecture

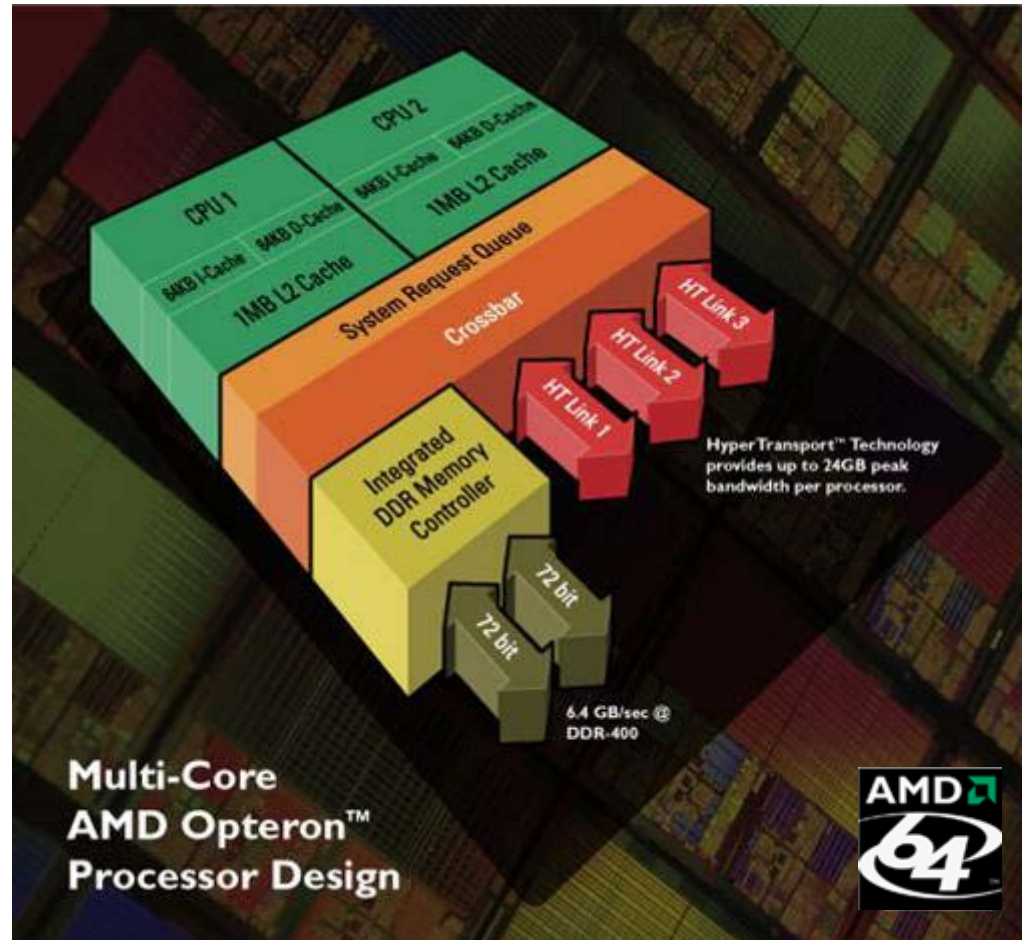


AMD64 Designed for Dual Core

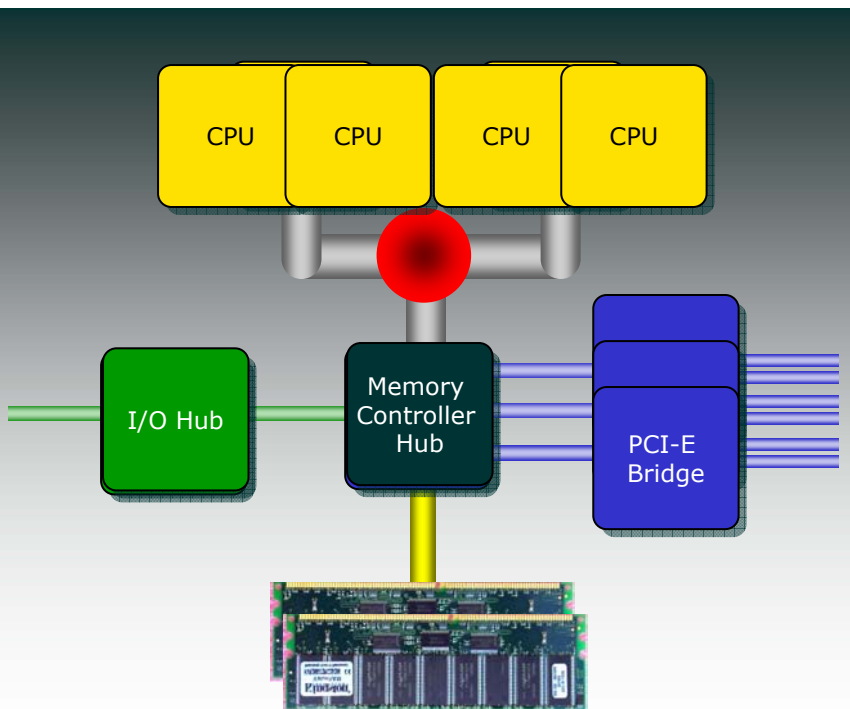
Socket Compatible with current 940 or 939 solutions

No Changes in Power

Non-disruptive migration

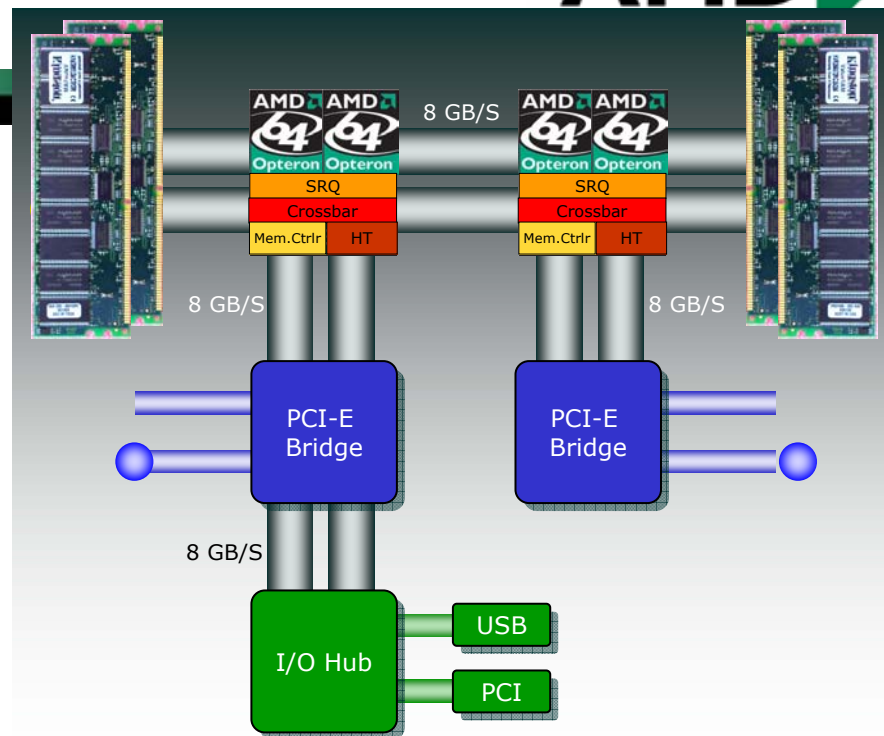


# Eliminating Architectural Bottlenecks



## Legacy x86 Architecture

- 20-year old front-side bus architecture
- CPUs, Memory, I/O all share a bus
- Major bottleneck to performance
- Faster CPUs or more cores  $\neq$  performance



## AMD64 Dual Core Key Benefits:

- higher density & higher performance
- lower latency
- equal power consumption



## ***Direct Connect Architecture:***

- CPUs connected directly to each other
- Memory connected directly to CPU's
- I/O brought closer to CPUs
- Two cores directly connected to each other on the die

## ***2 underlying technologies:***

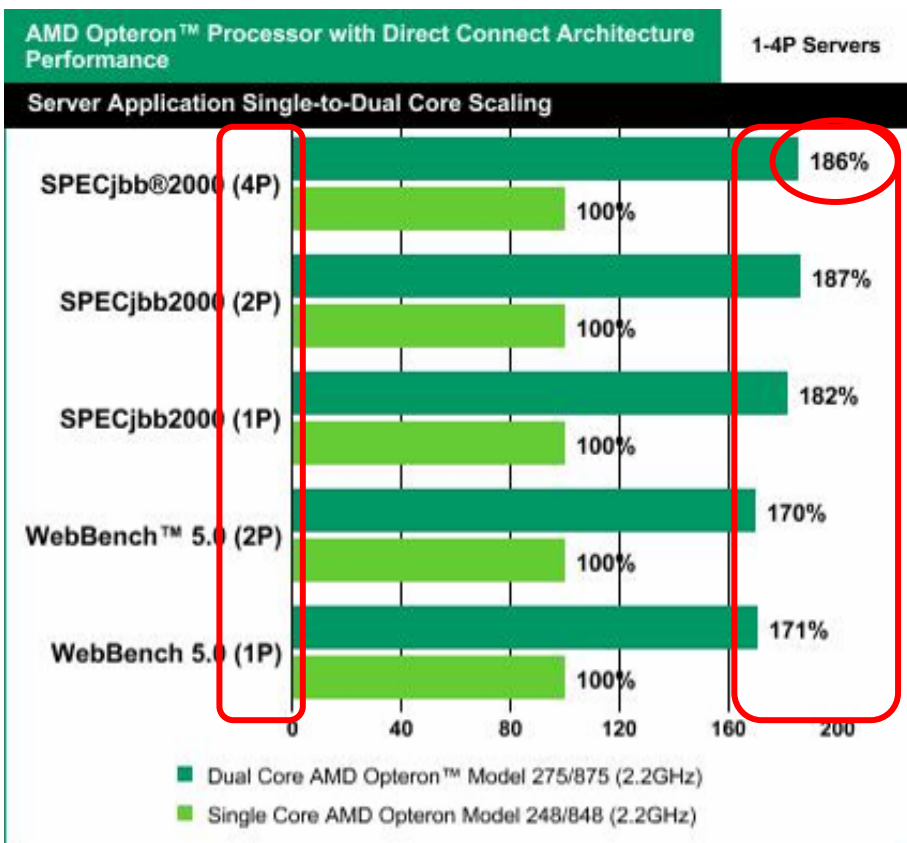
- HyperTransport
- Integrated Northbridge (Memory Controller)

## ***Result:***

- Higher Bandwidth
- Lower Latency
- Higher Scalability
  - With higher frequency
  - Dual Core
  - Better SMP Architecture

# Dual-Core AMD Opteron™ Performance

## Single Core to Dual Core Scaling



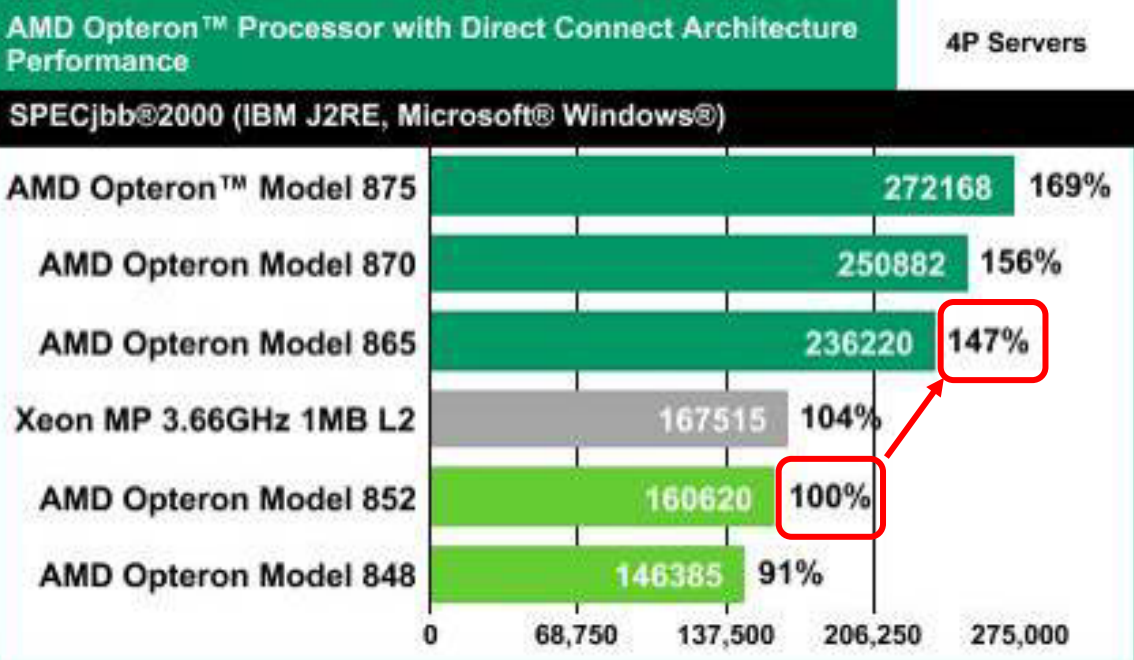
- Dual Core Model 275/875 provides up to **86% more performance** than Single Core Model 248/848 **at the same 2.2GHz frequencies**
- 70%+ Gains across the board, from 1P to 4P benchmarks (at same frequencies and power consumptions!)

Configuration information available on [www.amd.com](http://www.amd.com)

For additional server benchmark information, please visit [http://www.amd.com/us-en/Processors/ProductInformation/0,,30\\_118\\_8796\\_8800,00.html](http://www.amd.com/us-en/Processors/ProductInformation/0,,30_118_8796_8800,00.html)

# Dual-Core AMD Opteron™ Performance

## Single Core to Dual Core Price/Performance



- For the **same price**, Dual Core Model 865 delivers **47% more performance** than Single Core Model 852
- Xeon "Nocona", Hyper-Threading and all, is out-classed

- **Direct Connect Architecture**

- Fastest core-to-core communications

*No Bottlenecks*

- **Best upgrade story in the industry**

- DL145G2, DL385, DL585, BLXX series

*Use your existing 90nm infrastructure*

- **Best Performance per Watt**

- Dual-core performance boost in same power envelope

- **Best Performance per Footprint**

- Dual-core performance boost in existing enclosures

*Critical in a rack dense environment*







**Product life cycles**

**Time to market**

**Power Consumption / Heat**

**Large datasets**

**Performance requirements**

**Cost reduction**

- Company Overview
- AMD leadership
- AMD Opteron technology
- **Power Advantage**
- Software readiness
- Performance and Virtualisation benefits

# AMD Opteron™ Power Advantage – 4 CPU Server

***CPU level / Published Specifications based on Max Power***



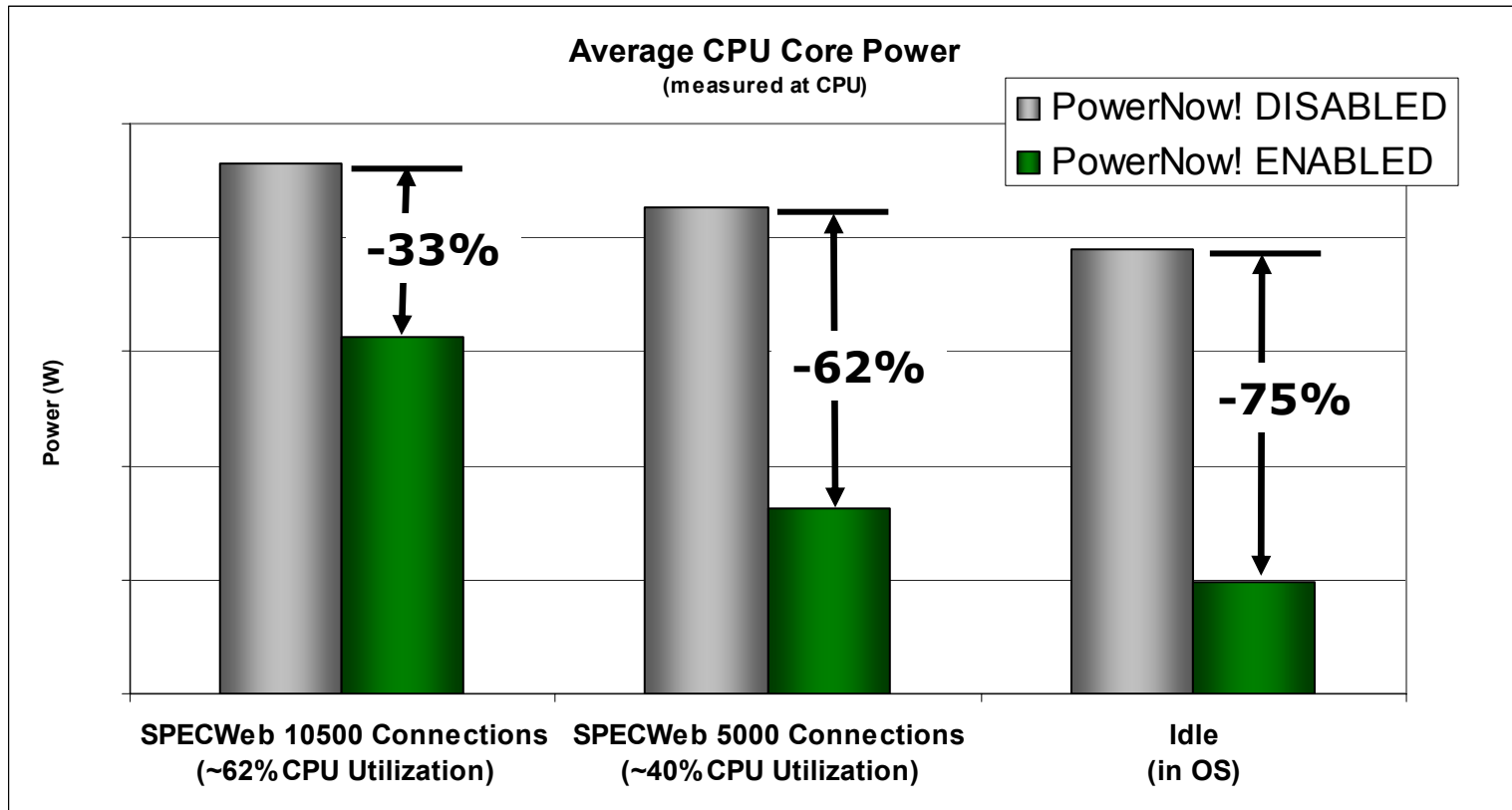
	AMD Opteron HE	AMD Opteron	Xeon MP 'Cranford'	Xeon MP 'Potomac'
CPU Max Wattage	55W	95W	120W	136W
Memory Controller Wattage	0W	0W	42.8W	42.8W
Total Wattage (4-CPU server)	220W	380W	522.8W	586.8W

$$\Delta = 206.8W$$

[per 4-CPU server]

- # of servers
- # of hours in use
- price/kWh

# AMD Opteron™ Power Advantage - Benefits of AMD PowerNow!™ Technology



AMD PowerNow!™ technology can provide up to 75% power savings!

# AMD Opteron Processor Power Advantage

## *Increasing Density without Facilities Upgrades*



(42u rack)  
Power Drop of 9 KVA



**AMD  
Opteron™  
(Single-Core)**

Supports  
82,244  
connections  
in a single  
rack

29

**VS.**

**Xeon**

Takes two racks  
worth of space to  
match AMD Opteron™  
performance

$$23 + 8 = 31$$

Power  
Maxed  
Out

23

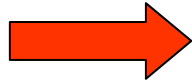
**Xeon**

Additional  
Rack  
Required

8

\* Performance based on  
SPECweb@99\_SSL

**4-bit processor:  
256 TB virtual memory  
1 TB physical memory**



**Product life cycles**

**Time to market**

**Power Consumption / Heat**

**Large datasets**

**Performance requirements**

**Cost reduction**



- Company Overview
- AMD leadership
- AMD Opteron technology
- Power Advantage
- **Software readiness**
- Performance and Virtualisation benefits

- AMD64=x86-64=x64=EM64T
- Different Operational Modes
  - 16/32-bit applications under 32-bit OS (IA32)
  - 32-bit application under 64-bit OS
  - 32/64-bit applications under 64-bit OS
  - 64-bit applications under 64-bit OS
- «Flat» address space in full 64-bit mode
  - No Paging!!!
- All the physical memory installed is available to 32-bit applications under 64-bit OS
  - Not the case with 32-bit OS
  - Apps basically work faster and more concurrent programs can run @ time
- 48TB Virtual Memory
- Native support of memory size > 4GB
- 64-bit address space and allow for complex data calculation

# Availability of AMD64 Operating Systems



- Linux 32/64-bit Environment

- SuSe (SLES family, Server Standard, 9.0 Professional)
- RedHat (Enterprise Linux - ES, AS, WS)
- Mandrake, Turbolinux, United Linux, Fedora, Debian



- MS Windows 32-bit Environment

- Certified for majority of current OS's including Windows 98, ME, 2000, XP Home, XP Professional, Server 2003 (standard and enterprise versions)

- MS Windows 64-bit Environment (x64)

- Already available (Windows XP Pro, 2 x Server versions)



- Unix/Solaris Environment

- Solaris 9 (32-bit) version is available
- Solaris 10 (64-bit) is available free of charge
- FreeBSD, NetBSD, OpenBSD (32/64-bit)



- Novell 6.5 (32 bit)



- **Oracle 9i, 10g**



- **IBM DB/2**



- **Microsoft SQL Server**  
(coming soon)

## **MCAD** (Windows dominated)

- Parametric Technology (PTC)
- Unigraphics (UGS)
- Dassault Systèmes
- SolidWorks

## **DCC** (Windows)

- Alias
- Softimage
- discreet
- Steinberg/Pinnacle

## **SW development**

Microsoft  
Sun [Solaris 10]

## **EDA** (mostly Linux, but Windows too)

- Synopsis
- Cadence
- Mentor Graphics

## **Visualization** (Linux + Windows)

### **Oil & Gas**

- Paradigm
- MagicEarth
- Schlumberger

### **Scientific Visualization**

- Mercury
- Volume Graphics

...

### **Visual Simulation**

- Realtime Technology (RTT)
- Intrace

## **CAE** (mostly Linux)

- MSC.Software
- Ansys/CFX
- Fluent
- Star-CD

- Company Overview
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- **Performance and Virtualisation benefits**





**Product life cycles**

**Time to market**

**Power Consumption / Heat**

**Large datasets**

**Performance requirements**

**Cost reduction**

# Dual-Core AMD Opteron™ Processor Performance

## 4P Enterprise Resource Planning Performance

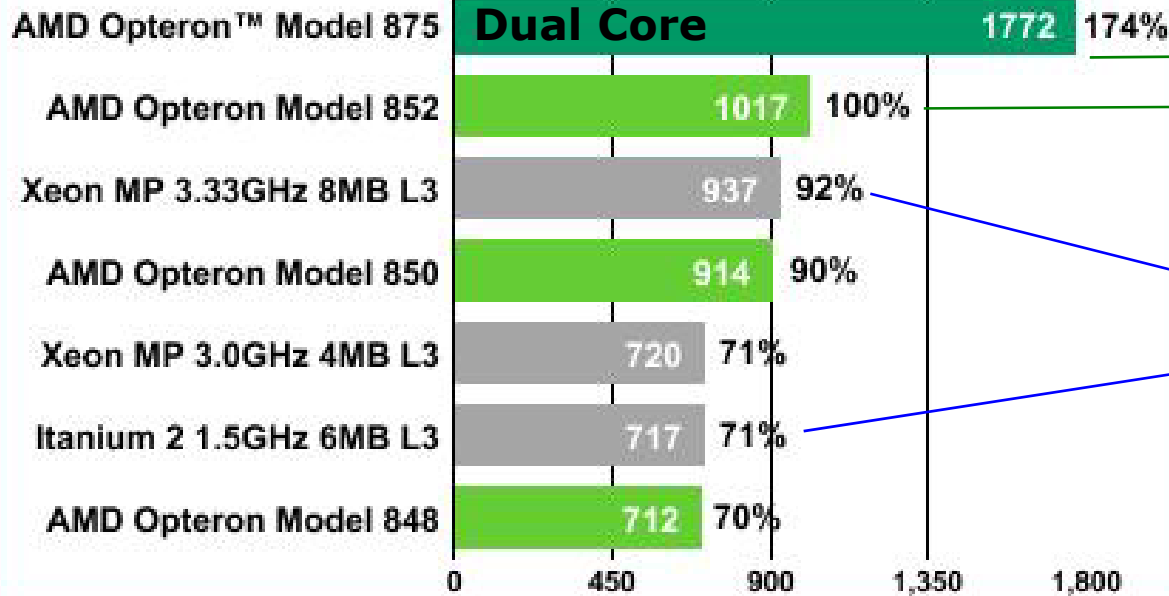
### SAP SD 2-Tier (Windows®)



AMD Opteron™ Processor with Direct Connect Architecture Performance

4P Servers

SAP Standard Application Sales and Distribution (SD) 2-Tier Performance  
Microsoft® Windows® Server 2003 Enterprise Edition



**Highest performing AMD Opteron™ dual and single core processors**

**Most expensively priced processors**

Microsoft and Windows are registered trademarks of the Microsoft Corporation in the United States and other jurisdictions. For complete SAP benchmark information visit <http://www.sap.com/benchmark>.



&



## Opteron Server

- HP DL 585 server
- (4) 850 2.4GHZ/1MB CPUs
- 16GB PC2700 RAM
- 2X72.8 GB 15K 15K-rpm Hot Pluggable HDD
- 24X CD-ROM DRIVE
- 12.7MM FDD, 2X800W REDUNDANT PSU

\$33,398

## Xeon Server

- IBM x445 Server (4xXeon MP)
- (4) 3GHz CPU's
- 16GB PC2100 RAM
- 2x 73.4GB 15K-rpm Ultra320 SCSI Hot-Swap SL HDD
- 3.0GHz/400MHz, 4MB L3, 2GB, O/Bay U320, 2x1200W p/s, Rack
- IBM ServerRAID-6M SCSI Controller (128MB Cache)

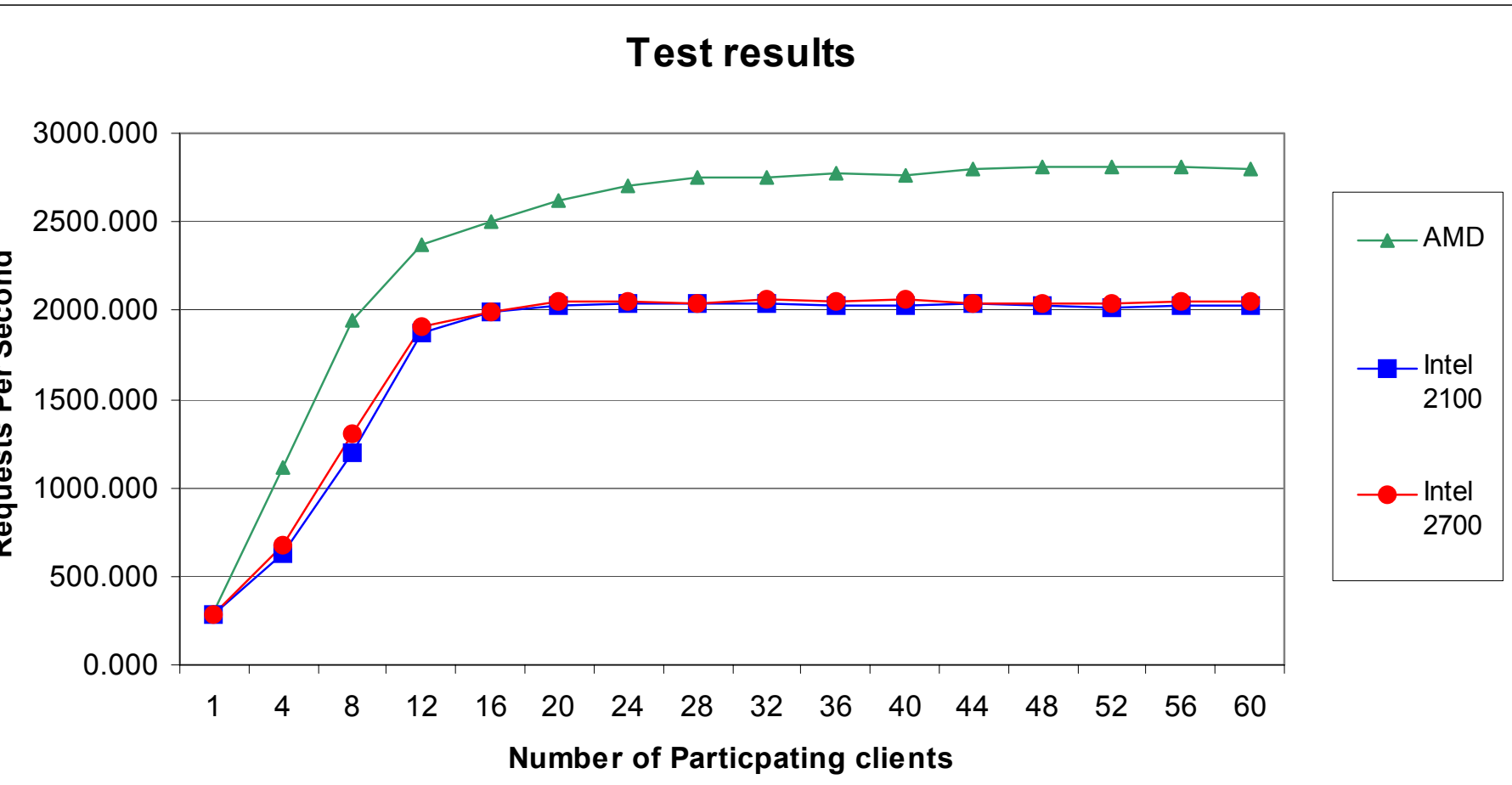
\$38,752

IBM x365 Server

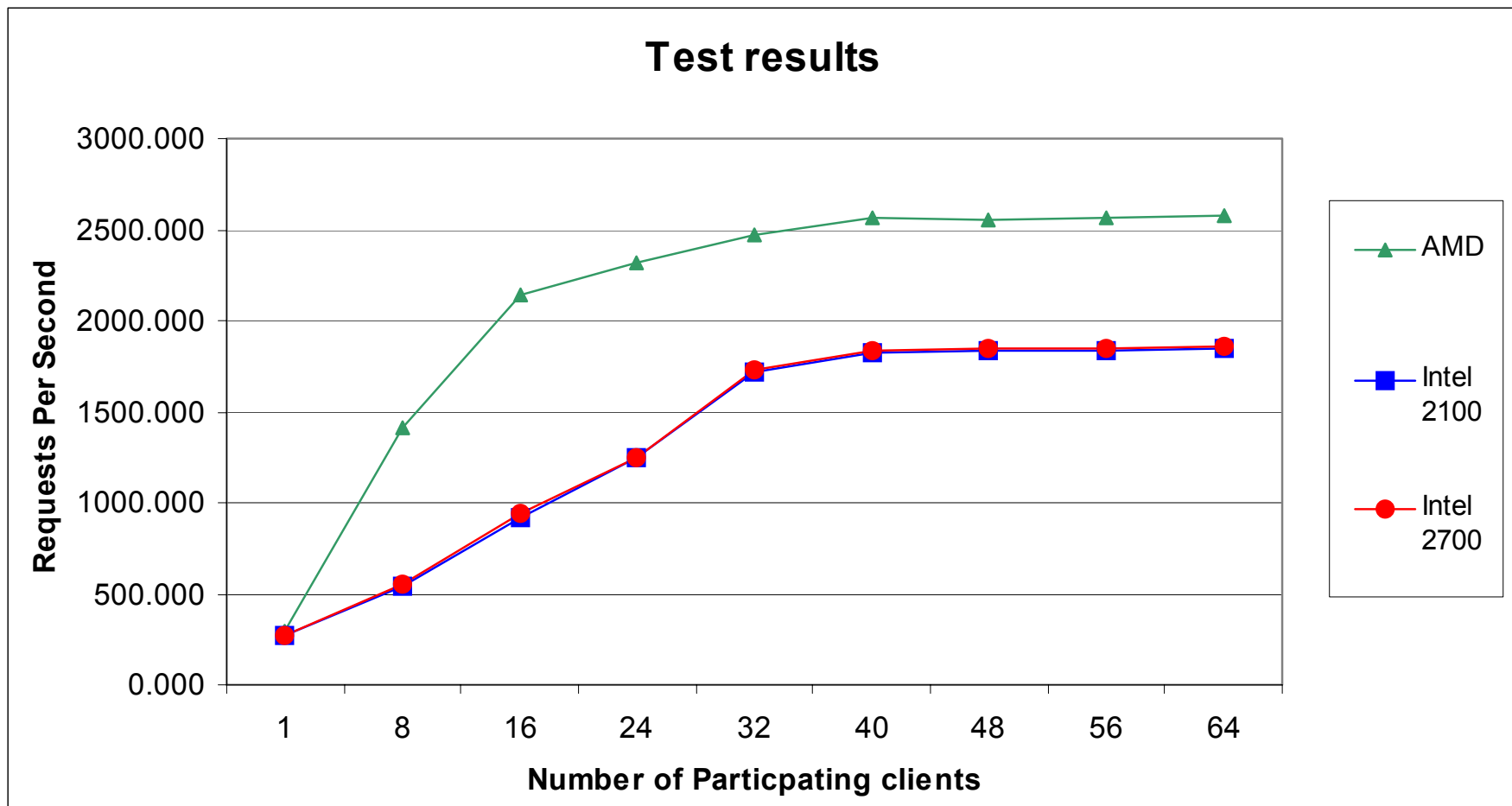
\$55,147

IBM x445 Server

# Web Bench: Opteron (HP DL 585) vs. Xeon (IBM x445): 4 VMs per machine (1 VM per CPU)



# Web Bench: Opteron (HP DL 585) vs. Xeon (IBM x445): 8 VMs per machine (2 VM per CPU)



- Using the same servers as used with the benchmarks to run TCO model

- Assumptions:

– 25% better performance (more VMs or more load per VM) w/ Opteron-based systems – VMs below are representative of was used for benchmark testing conducted running WebBench w/ VMware ESX

– HP DL 585: 16 VMs to 1 physical 4-way server: \$33,398

– IBM x365: 12 VMs to 1 physical 4-way server: \$38,752



Initial acquisition costs	Physical without Virtualization	Opteron HP DL 585	Xeon IBM x365	Savings Opteron - Xeon
Number of servers	200	13	17	
Initial operating system licensing cost	\$50,000	\$50,000	\$50,000	\$0
Server acquisition costs	<b>\$800,000</b>	<b>\$434,174</b>	<b>\$658,784</b>	<b>\$224,610</b>
Virtualized License	\$0	<b>\$135,000</b>	<b>\$175,000</b>	<b>\$40,000</b>
SAN	\$0	\$30,000	\$30,000	\$0
IT Labor Costs to provision physical servers	\$60,000	\$3,750	\$5,000	\$1,250
Network acquisition	\$100,000	\$6,250	\$8,333	\$2,083
Total Initial Acquisition Cost	<b>\$1,010,000</b>	<b>\$659,174</b>	<b>\$927,117</b>	<b>\$267,943</b>



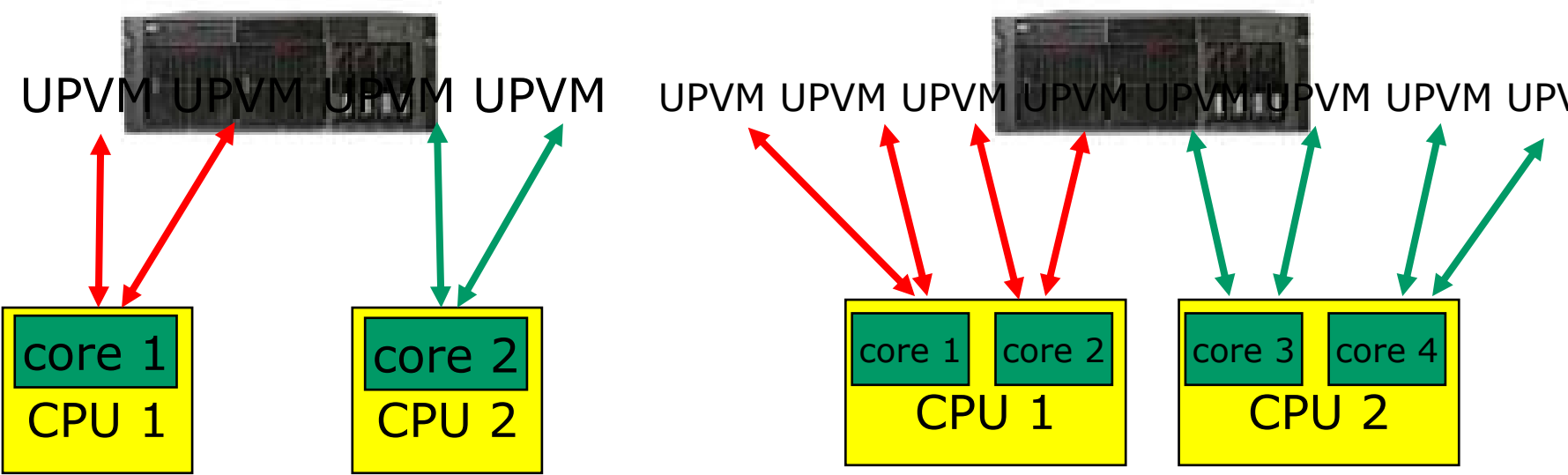
EXAMPLE: Opteron™ Dual-Core and Virtualization

2 UPVM (uni-processor virtual machine) per processor

AMD

(2-way Opteron Single Core)

(2-way Opteron Dual Core)



- Larger # of VMs/server
- Price/Performance
- Flexibility & Scalability

- Same flexibility & scalability of 4-way Single core server – consolidation density is higher
- Increased Price/ Performance
- More flexibility & Scalability

- Increase Performance via AMD Direct Connect Architecture
  - Maximize efficiencies within VMs and across VMs
  - Minimize overall system latency in memory & I/O intensive virtualization software environments
  
- Increase price/performance
  - more virtual machines/server
  - Lower overall utilization per virtual machine
  
- Improve TCO
  
- Increase Flexibility & Scalability
  - Single Core
  - Dual Core

# Maximizing Your IT Investment Server-Based Computing



## **Problem:**

- Terminal servers need to support multiple client sessions running 32-bit application software with good response time

## **Solution:**

- AMD64 + Windows x64 delivers fast, scalable memory access to support more simultaneous user sessions
- HyperTransport™ technology enables AMD64 + Windows x64 to deliver data faster to multiple computers
- AMD64 dual-core technology + Windows x64 increases system capabilities without increasing power

## **Results:**

- Support for more users and transactions with a server that offers excellent performance-per-watt capabilities

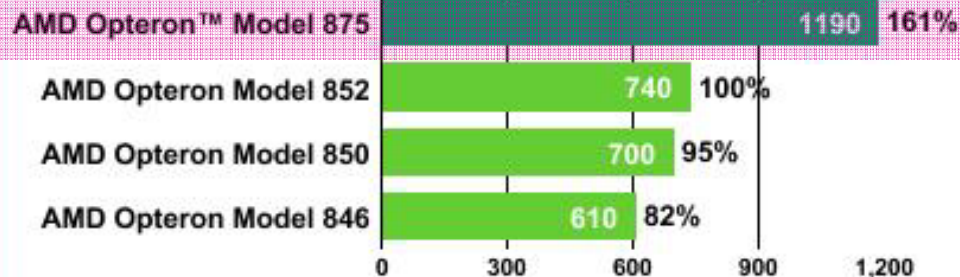
# Example: SBC & Terminal Services



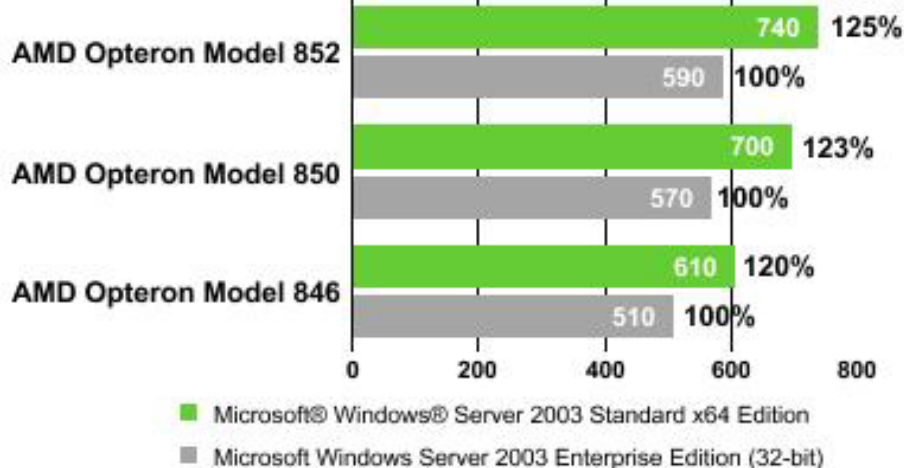
## AMD Opteron™ Processor with Direct Connect Architecture Performance

4P Servers

### Microsoft Terminal Services Performance (Microsoft® Windows® Server 2003 Standard x64 Edition)



### Microsoft Terminal Services Performance (32-bit vs. 64-bit Microsoft Windows Server 2003)

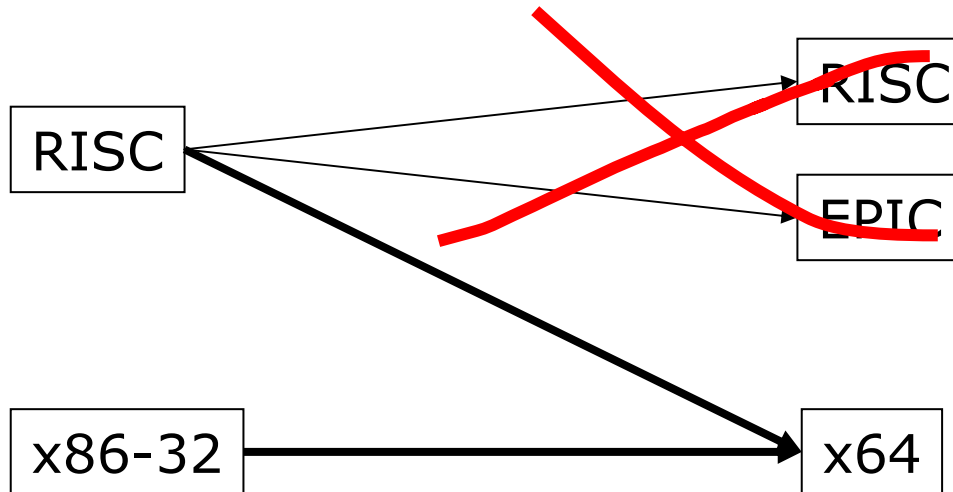


**~65% more users  
on 64-bit (Microsoft)**

# Migration to Industry Standard Server



## Current Situation



## Different Options

- Proprietary
- Hardware
  - OS
  - Applications



Target: Reducing TCO!

- Standard
- Hardware
  - OS
  - Applications

**HP systems with AMD64 technology enables you to meet your needs**



**Power Consumption / Heat**



**Large datasets**



**Performance requirements**



**Cost reduction**





Thank you!

For more info visit:

[www.amd.com/enterpriseevent](http://www.amd.com/enterpriseevent)

<http://multicore.amd.com>

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A horizontal decorative bar with a gradient from dark green on the left to black on the right.

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# Dual-Core AMD Opteron™ Processor Performance

## 4P Enterprise Resource Planning Performance

### SAP SD 2-Tier (Windows®)



1. 4 AMD Opteron™ processors Model 875 with 1MB L2 cache in HP ProLiant DL585, 32GB memory, Microsoft® Windows® Server 2003, Enterprise Edition (64-bit), Microsoft SQL Server 2000. Certification: see [www.sap.com/benchmark](http://www.sap.com/benchmark).
2. 4 AMD Opteron processors Model 852 with 1MB L2 cache in HP ProLiant DL585, 16GB memory, Microsoft Windows Server 2003, Enterprise Edition (64-bit), Microsoft SQL Server 2000. Certification 2005004.
3. 4 Xeon MP processors 3.33GHz with 8MB L3 cache in HP ProLiant DL580, 32GB memory, Microsoft Windows Server 2003, Enterprise Edition (64-bit), Microsoft SQL Server 2000. Certification 2005012.
4. 4 AMD Opteron processors Model 850 with 1MB L2 cache in HP ProLiant DL585, 12GB memory, Microsoft Windows Server 2003, Enterprise Edition, Microsoft SQL Server 2000. Certification 2004024.
5. 4 Xeon MP processors 3.0GHz with 4MB L3 cache in IBM xSeries 365 Model 88626RX, 8GB memory, Microsoft Windows Server 2003, Enterprise Edition, DB2 UBD 8.1. Certification 2004019.
6. 4 Intel Itanium 2 1.5GHz processor with 6MB L3 cache in HP Integrity rx4640, 32GB memory, Microsoft Windows Server 2003, Enterprise Edition, Microsoft SQL Server 2000 Enterprise Edition 64-bit. Certification 2004016.
7. 4 AMD Opteron processors Model 848 with 1MB L2 cache in HP ProLiant DL585, 16GB memory, Microsoft Windows Server 2003, Enterprise Edition, Microsoft SQL Server 2000. Certification 2004018.

# Dual-Core AMD Opteron™ Processor Performance

## 4P Terminal Server Performance

### Microsoft® Windows® Server 2003 – 32-bit and x64



- 1. AMD Opteron™ processor Model 852, 850 and 846-based system (32-bit results):** Hardware: AMD "Quartet" internal development platform (not publicly available). Processor: Qty. (4), L1 Cache 2x 128KB (64KB data + 64KB inst), L2 Cache 2 x 1024KB, Memory: 8GB total. Hard Disk: 15 x 36GB U320 SCSI. Operating System: Microsoft® Windows® Server 2003 Enterprise Edition (Build 3790). Workload: Data Entry Worker, Office XP.
- 2. AMD Opteron processor Model 852, 850 and 846-based system (64-bit results):** Hardware: AMD "Quartet" internal development platform (not publicly available). Processor: Qty. (4), L1 Cache 2x 128KB (64KB data + 64KB inst), L2 Cache 2 x 1024KB, Memory: 16GB total. Hard Disk: 15 x 36GB U320 SCSI. Operating System: Microsoft Windows Server 2003 Standard x64 Edition (Build 1421). Workload: Data Entry Worker, Office XP.
- 3. AMD Opteron processor Model 875-based system:** Hardware: AMD "Quartet" internal development platform (not publicly available). Processor: Qty. (4), L1 Cache 2x 128KB (64KB data + 64KB inst), L2 Cache 2 x 1024KB, Memory: 32GB total. Hard Disk: 15 x 36GB U320 SCSI. Operating System: Microsoft Windows Server 2003 Standard x64 Edition (Build 1421). Workload: Data Entry Worker, Office XP.

Source AMD

# Dual-Core AMD Opteron™ Processor Performance

## 4P OLTP Database Performance

### TPC-C™ (Microsoft® Windows® Enterprise Edition)



1. 4 AMD Opteron™ processors Model 852 in HP ProLiant DL585, 64GB memory, Microsoft® Windows® Server 2003, Enterprise Edition SP1, Microsoft SQL Server 2000 Enterprise Edition with QFE, with 6 Xeon 3.06GHz clients. Reference as published 130,623 tpmC, \$2.80 \$/tpmC.  
[http://www.tpc.org/tpcc/results/tpcc\\_result\\_detail.asp?id=105021103](http://www.tpc.org/tpcc/results/tpcc_result_detail.asp?id=105021103)
2. 4 AMD Opteron processors Model 850 in HP ProLiant DL585, 64GB memory, Microsoft® Windows® Server 2003, Enterprise Edition SP1, Microsoft SQL Server 2000 Enterprise Edition SP3, with 6 Xeon 3.06GHz clients. Reference as published 123,027 tpmC, \$2.94 \$/tpmC. [http://www.tpc.org/tpcc/results/tpcc\\_result\\_detail.asp?id=104120801](http://www.tpc.org/tpcc/results/tpcc_result_detail.asp?id=104120801)
3. 4 Itanium 1.5GHz processors with 6MB L3 cache in HP rx5670 server, 64GB memory, Microsoft Windows Server 2003, Enterprise Edition (64-bit), Microsoft SQL Server 2000 Enterprise Edition SP3 (64-bit), with 16 Pentium III 1.4GHz clients. Reference as published 115,110 tpmC, \$4.49 \$/tpmC.  
[http://www.tpc.org/tpcc/results/tpcc\\_result\\_detail.asp?id=103042401](http://www.tpc.org/tpcc/results/tpcc_result_detail.asp?id=103042401)
4. 4 AMD Opteron processors Model 850 in HP ProLiant DL585, 32GB memory, Microsoft Windows Server 2003, Enterprise Edition, Microsoft SQL Server 2000 Enterprise Edition SP3, with 6 Xeon 3.06GHz clients. Reference as published 115,110 tpmC, \$2.62 \$/tpmC. [http://www.tpc.org/tpcc/results/tpcc\\_result\\_detail.asp?id=104101503](http://www.tpc.org/tpcc/results/tpcc_result_detail.asp?id=104101503)
5. 4 AMD Opteron processors Model 848 in HP ProLiant DL585, 32GB memory, Microsoft Windows Server 2003, Enterprise Edition, Microsoft SQL Server 2000 Enterprise Edition SP3, with 6 Xeon 2.8GHz clients. Reference as published 105,687 tpmC, \$3.23 \$/tpmC. [http://www.tpc.org/tpcc/results/tpcc\\_result\\_detail.asp?id=104043002](http://www.tpc.org/tpcc/results/tpcc_result_detail.asp?id=104043002)
6. 4 Xeon MP 3.0GHz processors with 4MB L3 cache in IBM eServer xSeries 365 c/s, 32GB memory, Microsoft Windows Server 2003 Enterprise Edition with QFE KB834628, Microsoft SQL Server 2000 Enterprise Edition SP3 with QFE, with 6 Xeon 3.06GHz clients. Reference as published: 102,667 tpmC, 3.52 \$/tpmC.  
[http://www.tpc.org/tpcc/results/tpcc\\_result\\_detail.asp?id=104030102](http://www.tpc.org/tpcc/results/tpcc_result_detail.asp?id=104030102)
7. 4 Xeon MP 2.8GHz processors with 2MB L3 cache in IBM eServer xSeries 445 c/s, 32GB memory, Microsoft Windows Server 2003 Enterprise Edition, Microsoft SQL Server 2000 Enterprise Edition SP3 with QFE, with 3 xSeries 225 clients. Reference as published: 90,271.76 tpmC, 3.97 \$/tpmC.  
[http://www.tpc.org/tpcc/results/tpcc\\_result\\_detail.asp?id=103101701](http://www.tpc.org/tpcc/results/tpcc_result_detail.asp?id=103101701)

# Dual-Core AMD Opteron™ Processor Performance

## 2P Enterprise Resource Planning Performance

### SAP SD 2-Tier (Windows®) Blade Servers



1. 2 AMD Opteron™ processors Model 252 with 1MB L2 cache in HP ProLiant BL25p, 16GB memory, Microsoft® Windows® Server 2003, Enterprise Edition (64-bit), Microsoft SQL Server 2000. Certification: 2005006.
2. 2 AMD Opteron processors Model 250 with 1MB L2 cache in HP ProLiant BL35p, 8GB memory, Microsoft Windows Server 2003, Enterprise Edition (64-bit), Microsoft SQL Server 2000. Certification 2005007.
3. 2 Xeon 3.6GHz processors with 2MB L2 cache in Fujitsu-Siemens PRIMERGY BX600 S2, 12GB memory, Microsoft Windows Server 2003, Enterprise Edition (64-bit), Microsoft SQL Server 2000. Certification 2005003.
4. 2 Xeon 3.2GHz processors with 2MB L3 cache in IBM eServer BladeCenter HS20, 6GB memory, Microsoft Windows Server 2003, Enterprise Edition (64-bit), Microsoft SQL Server 2000. Certification 2004031.
5. 2 Xeon 3.06GHz processors with 2MB L3 cache in HP ProLiant BL20p G2, 8GB memory, Microsoft Windows Server 2003, Enterprise Edition (64-bit), Microsoft SQL Server 2000. Certification 2003049.

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